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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
|-----------------|-------------|----------------------|---------------------|------------------|

10/588,605

08/07/2006

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074782-0022

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04/14/2009

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EXAMINER

HUYNH, ANDY

ART UNIT

PAPER NUMBER

2818

MAIL DATE

DELIVERY MODE

04/14/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

| | | | |
|------------------------------|--------------------------------------|--------------------------------------|--|
| Office Action Summary | Application No. 10/588,605 | Applicant(s) SAITOH ET AL. | |
| | Examiner ANDY HUYNH | Art Unit 2818 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 March 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) 11-18, 24 and 25 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7 and 19-23 is/are rejected.
- 7) ☒ Claim(s) 8-10 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 August 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>08/07/2006</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

This is responsive to Applicants' Response to Election/Restriction Requirement filed March 2, 2009. In view of the Response, Applicants have elected Group I, including Claims **1-10 and 19-23**, for initial examination on the merits is acknowledged. Because Applicants did not distinctly and specifically point out the supposed error in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)). Accordingly, Claims 14-18, 24 and 25 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 35 § 1.142(b) and MPEP § 821.03. Applicants have the right to file a divisional application covering the subject matter of the non-elected claims.

Priority

Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d) based on an application filed in JAPAN, 2004-381574 on 12/28/2004.

Information Disclosure Statement

This office acknowledges receipt of the following items from the applicant: Information Disclosure Statement(s) (IDS(s)) filed on 08/07/2006. The references cited on the PTOL 1449 form have been considered.

Claim Objections

Claims **1 and 19** are objected to because of the following reasons.

At line 1, “comprising” should read –comprising:--.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims **3-4** are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim **3** recites the limitation “the insulating layer is made of an oxide of the first semiconductor material” is vague which renders the claim indefinite. What does “an oxide of the first semiconductor material” mean and how is the first semiconductor material of the insulating layer related to the first semiconductor material of the channel region, and how can the first semiconductor material be an oxide?

Claim **4** is rejected for incorporating the defects of the claim **3**.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims **1, 5, 19, 20, 22 and 23** are rejected under 35 U.S.C. 102(e) as being anticipated by US 7,067,867 B2 to Duan et al. hereinafter “Duan.”

Regarding Claim **1**, Duan discloses in Figs. 3A-3D, 4A and 4B and related texts as set forth in col. 13, line 59-col. 14, line 60, a nanowire 330 comprising:

a plurality of contact regions/end portions of the nanowire 330 which is a part of a uniformly doped single crystal nanowire 300 (Fig. 3A, col. 13, lines 59-62), and

at least one channel region/doped surface layer 302 of the nanowire 330, which is connected to the contact regions/end portions of the nanowire 330,

wherein the channel region/doped surface layer 302 of the nanowire 330 is made of a first semiconductor material and the surface of the channel region/doped surface layer 302 of the nanowire 330 is covered with an insulating/dielectric layer 304 that has been formed selectively (see Note) on the channel region/doped surface layer 302 of the nanowire 330 (Fig. 3D), and

wherein the contact regions/end portions of the nanowire 330 are made of a second semiconductor material, which is different from the first semiconductor material for the channel region/doped surface layer 302 of the nanowire 330, and at least the surface of the contact regions/end portions of the nanowire 330 includes a conductive portion, a part of a uniformly

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doped single crystal nanowire 300 can be doped into either p- or n-type semiconductors (Fig. 3A, col. 13, lines 59-62).

Note: the “that has been formed selectively” is taken to be a product by process limitation and consider non-limitation. In a product-by-process claim, it is the patentability of the claimed product and not of the recited process steps which must be established. Therefore, when the prior art discloses a product which reasonably appears to be identical with or only slightly different than the product claimed in a product-by process claim, a rejection based on sections 102 or 103 is fair. The Patent Office is not equipped to manufacture products by a myriad of processes put before it and then obtain prior art product and make physical comparisons therewith. In re Brown, 173 USPQ 685 (CCPA 1972). Also, a product by process claim directed to the product per se, no matter how actually made, In re Hirao, 190 USPQ I S at 17 (footnote 3). See In re Fessman, 180 USPQ 324, 326 (CCPA 1974); In re Marosi et al., 218 USPQ 289, 292 (Fed. Cir. 1983); and particularly In re Thorpe, 227 USPQ 964, 966 (Fed. Cir. 1985), all of which make it clear that it is the patentability of the final structure of the product "gleaned" from the process steps, which must be determined in a " product by process" claim, and not the patentability of the process. See also MPEP 2113. Moreover, an old and obvious product produced by a new method is not a patentable product, whether claimed in "product by process" claims or not.

Regarding Claim 5, Duan discloses in Figs. 3A-3D the insulating/dielectric layer 304 covers the surface of the channel region/doped surface layer 302 of the nanowire 330 but does not cover the surface of the contact regions/end portions of the nanowire 330 which is a part of a uniformly doped single crystal nanowire 300.

Regarding Claim 19, Duan discloses in Figs. 3A-3D, 4A and 4B and related texts as set forth in col. 13, line 59-col. 14, line 60, an electronic element comprising:

at least one nanowire 100/330, and

a plurality of electrodes 202/206, which are electrically connected to the nanowire 100/330 (Figs. 3D, 4A-4B),

wherein each said nanowire 100/330 includes: a plurality of contact regions/end portions of the nanowire 100/330 which is a part of a uniformly doped single crystal nanowire 300 (Fig. 3A, col. 13, lines 59-62), including two contact regions that contact with associated ones of the electrodes 202/206, and at least one channel region/doped surface layer 302 of the nanowire 100/330, which is connected to the contact regions/end portions of the nanowire 100/330,

wherein the channel region/doped surface layer 302 of the nanowire 100/330 is made of a first semiconductor material and the surface of the channel region/doped surface layer 302 of the nanowire 330 is covered with an insulating/dielectric layer 304 that has been formed selectively (see Note 1) on the channel region/doped surface layer 302 of the nanowire 100/330 (Figs. 3D, 4A-4B), and

wherein the contact regions/end portions of the nanowire 100/330 are made of a second semiconductor material, which is different from the first semiconductor material for the channel region/doped surface layer 302 of the nanowire 100/330, and at least the surface of the contact regions/end portions of the nanowire 100/330 includes a conductive portion, a part of a uniformly doped single crystal nanowire 100/300 can be doped into either p- or n-type semiconductors (Fig. 3A, col. 13, lines 59-62).

Note 1: the “that has been formed selectively” is taken to be a product by process

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limitation and consider non-limitation. In a product-by-process claim, it is the patentability of the claimed product and not of the recited process steps which must be established. Therefore, when the prior art discloses a product which reasonably appears to be identical with or only slightly different than the product claimed in a product-by process claim, a rejection based on sections 102 or 103 is fair. The Patent Office is not equipped to manufacture products by a myriad of processes put before it and then obtain prior art product and make physical comparisons therewith. In re Brown, 173 USPQ 685 (CCPA 1972). Also, a product by process claim directed to the product per se, no matter how actually made, In re Hirao, 190 USPQ I S at 17 (footnote 3). See In re Fessman, 180 USPQ 324, 326 (CCPA 1974); In re Marosi et al., 218 USPQ 289, 292 (Fed. Cir. 1983); and particularly In re Thorpe, 227 USPQ 964, 966 (Fed. Cir. 1985), all of which make it clear that it is the patentability of the final structure of the product "gleaned" from the process steps, which must be determined in a " product by process" claim, and not the patentability of the process. See also MPEP 2113. Moreover, an old and obvious product produced by a new method is not a patentable product, whether claimed in "product by process" claims or not.

Regarding Claim **20**, Duan discloses the electronic element further comprising a gate electrode 204, which is insulated from the channel region/doped surface layer 302 of the nanowire 100/330 and which applies an electric field to the channel region/doped surface layer 302 of the nanowire 100/330 (see Note 2).

Note 2: The recitation "which applies an electric field to the channel region" refers to an functional limitation and any such limitation must distinguish from the prior art in terms of structure rather than function, In re Schreiber, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-

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32 (Fed. Cir. 1997); See also *In re Swinehart*, 439 F.2d 210, 212-13, 169 USPQ 226, 228-29 (CCPA 1971). Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danly*, 263 F. 2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). “Apparatus claims cover what a device is, not what a device does.” *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F. 2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990).

Regarding Claims **22 and 23**, Duan discloses an electronic/semiconductor device 200 comprising: a plurality of electronic elements; a line/nanowire 100 for connecting the electrodes 202/206 together; and a substrate 208 for supporting the electronic elements and the line/nanowire 100 thereon; wherein the nanowires 100 included in the electronic elements are aligned in a particular direction on the substrate 208 (Figs. 4A-4B).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims **2, 6, 7, and 21** are rejected under 35 U.S.C. 103(a) as being unpatentable over US 7,067,867 B2 to Duan et al. hereinafter "Duan."

Regarding Claim **2**, Duan does not disclose the following limitations. It would have been obvious to one having ordinary skill in the art at the time of the invention was made to select the first semiconductor material being $\text{Si}_x\text{Ge}_{1-x}$ (where $0 < x \leq 1$) and the second semiconductor material being $\text{Si}_y\text{Ge}_{1-y}$ (where $0 \leq y < 1$ and $x \neq y$), since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use.

Regarding Claims **6, 7 and 21**, Duan disclose the conductive portion of the contact regions/end portions of the nanowire 330, a part of a uniformly doped single crystal nanowire 300 can be doped into either p- or n-type semiconductors (Fig. 3A, col. 13, lines 59-62), is made of the second semiconductor material that has been doped with a dopant except for the following limitations. However, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to form the channel region has a length of 1,000 nm or less as measured along the axis of the nanowire, wherein the dopant has a higher conductivity than the channel region/doped surface layer 302 of the nanowire 330, since it has been held that

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discovering an optimum value of a result effective variable involves only routine skill in the art.

In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Allowable Subject Matter

Claims **8-10** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims, since the prior art made of record and considered pertinent to the applicant's disclosure does not teach or suggest the claimed limitations. The prior art of record fails to teach or render obvious the nanowire wherein the conductive portion of the contact regions is made of an alloy in which a constituent element of the second semiconductor material and a metal element are bonded together as recited in claim **8**.

Conclusion

A shortened statutory period for response to this action is set to expire 3 (three) months and 0 (zero) day from the day of this letter. Failure to respond within the period for response will cause the application to become abandoned (see M.P.E.P 710.02(b)).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andy Huynh, (571) 272-1781. The examiner can normally be reached on Monday-Friday from 6:30 AM to 3:00 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Loke can be reached on (571) 272-1657. The Fax number for the organization where this application or proceeding is assigned is (571) 273-8300.

Any inquiry of a general nature or relating to the -status of this application or proceeding should be directed to the receptionist whose phone number is (703) 308-0956.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Andy Huynh/
Primary Examiner, Art Unit 2818